

**WHAT IS CLAIMED IS:**

1. A method for creating a representation of a plant and incorporating it into a run time prediction system for generating predicted output values representing the operating parameters of the plant during operation thereof, comprising the steps of:

5 providing a historical database representing the operation of the plant and comprised of data associated with plant inputs and plant outputs;

extracting data from the historical database and creating a dataset of variables corresponding to the inputs and outputs from the historical database;

10 creating an off-line predictive model of the plant utilizing the created dataset to predict a plant output and defined by off-line model parameters;

creating an on-line model for generating predicted output values in real time during the operation the a plant and defined by on-line model parameters; and

replacing the on-line model parameters with the off-line model parameters after generation thereof.

2. The method of Claim 1, wherein the historical database is integral with the operation of the plant in real time.

3. The method of Claim 1, wherein the inputs to the plant are manipulatable variables for operating the plant.

4. The method of Claim 1, wherein the outputs of the plant in the historical database constitute measurable variables which are measured outputs from the plant during operation thereof.

5. The method of Claim 1, wherein the step of extracting data from the database and creating a dataset includes the step of preprocessing the data extracted from the historical database to modify the data in accordance with a predetermined preprocess routine.

6. The method of Claim 1, wherein the step of creating an off-line predictive model comprises training a neural network with the data in the dataset to create a stored representation thereof with the neural network mapping the inputs thereto through the stored representation to provide the predicted output values.

7. The method of Claim 1, wherein the predicted output values comprise an unmeasured output in the historical database and wherein the outputs in the historical database constitute measurable outputs.

8. The method of Claim 1, and further comprising the step of testing the off-line predicted model with data in the historical database prior to the step of replacing.

9. The method of Claim 8, wherein the step of testing comprises reading select ones of the variables defined by the off-line predictive model from the historical database to ensure that the variables in the created off-line predictive model can be read.

10. The method of Claim 8, wherein the step of testing comprises writing to the historical database values that correspond to variables in the created off-line predictive model to ensure that data can be written to these variable locations in the historical database.

11. The method of Claim 8, wherein the step of testing comprises reading from a location in the historical database corresponding to the predicted output value as defined by the off-line predictive model to ensure that the predicted output value name in the created off-line predictive model corresponds to a variable name in the historical database.

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12. The method of Claim 8, wherein the step of testing comprises writing the predicted output value to a corresponding location in the historical database to ensure that there is such a location in the historical database to ensure that the step of replacing will replace the on-line model parameters with the correct off-line model parameters.

13. The method of Claim 8, wherein the operation of the on-line model will be paused during the step of testing.

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14. A method for assisting a user in the operation of creating a representation of a plant and incorporating it into a run time prediction system for generating predicted output values representing the operating parameters of the plant during operation thereof, comprising the steps of:

- 5                   providing a display;  
                  providing a historical database;  
                  displaying an extraction graphical assist device with associated  
interactive instructions to assist the user in extracting data from a historical database  
representing the operation of the plant and comprised of data associated with plant  
10           inputs and plant outputs, and creating a dataset of variables corresponding to the inputs  
and outputs from the historical database when the user has completed the instructions;  
                  displaying a model building graphical assist device with associated  
interactive instructions to assist the user in creating an off-line predictive model of the  
plant utilizing the created dataset to predict a plant output and defined by off-line model  
15           parameters;  
                  displaying a graphical assist device with associated interactive  
instructions to assist the user in replacing the on-line model parameters an on-line  
model with the off-line model parameters after generation thereof, which on-line model  
is operable to generate predicted output values in real time during the operation the a  
20           plant and defined by the on-line model parameters.

15. The method of Claim 14, wherein the step of assisting the user in extracting data from the database and creating a dataset includes the step of assisting the user in preprocessing the data extracted from the historical database to modify the data in accordance with a predetermined preprocess routine.

16. The method of Claim 14, wherein the step of assisting the user in creating an off-line predictive model comprises assisting the user in training a neural network with the data in the dataset to create a stored representation thereof with the neural network mapping the inputs thereto through the stored representation to provide the predicted output values.

17. The method of Claim 14, and further comprising the step of displaying a test graphical assist device with associated interactive instructions to assist the user in testing the off-line predicted model with data in the historical database prior to the step of assisting to replace.

18. The method of Claim 17, wherein the step of assisting the user to test the off-line model comprises assisting the user in reading select ones of the variables defined by the off-line predictive model from the historical database to ensure that the variables in the created off-line predictive model can be read.

19. The method of Claim 17, wherein the step of assisting the user to test the off-line model comprises assisting the user in writing to the historical database values that correspond to variables in the created off-line predictive model to ensure that data can be written to these variable locations in the historical database.

20. The method of Claim 17, wherein the step of assisting the user to test the off-line model comprises assisting the user in reading from a location in the historical database corresponding to the predicted output value as defined by the off-line predictive model to ensure that the predicted output value name in the created off-line predictive model corresponds to a variable name in the historical database.

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21. A method for determining an output value having a known relationship to an input value with a predicted value, comprising the steps of:

training a predictive model with a set of known outputs for a given set of inputs that exist in a finite dataset;

inputting data to the predictive model that is within the set of given inputs; and

predicting an output from the predictive model that corresponds to the given input such that a predicted output value will be obtained which will have associated therewith the errors of the predictive model.

22. The method of Claim 21, wherein the predictive model is a non-linear model.

23. The method of Claim 21, wherein the set of known outputs for a given set of inputs is derived from at least one physical property table.

24. The method of Claim 21, wherein the set of known outputs for a given set of inputs is derived from a plurality of physical property tables.

25. The method of Claim 24, wherein the predictive model includes at least one input that is a discriminating input to define which of said tables is associated with the inputs, such that processing the input through the predictive model will process it through a learned representation of only that table.

26. The method of Claim 21, wherein the predictive model is trained on less than all of the data in the physical property tables.

27. A method for defining the relationship of output variables to input variables in a spreadsheet, comprising the steps of:

defining a set of input variables;

defining at least one output variable that has a known relationship with the input variables, which known relationship between the output variables and the input variables is contained in a dataset; and

determining the value of the output variable from the input variable by mapping the input variable through a stored representation of the dataset in a predictive model to predict the output variable from the stored representation and replacing the previous value of the corresponding output variable with the predicted value for the output variable.

28. The method of Claim 27, wherein the step of mapping comprises mapping the input variable through a stored representation of the dataset in a non-linear predictive model.

29. The method of Claim 27, wherein the stored representation represents less than all of the data within the dataset.

30. The method of Claim 27, wherein the dataset comprises a physical property table and the input variables and the output variables comprise physical properties that are within the physical property table.

31. The method of Claim 30, wherein there is a known output within the dataset for each of the input variables utilizing the step of determining.

B1 32. The method of Claim 27, wherein the step of determining is initiated in response to the input of a change to any one of the defined set of inputs, wherein the inputs and outputs are arranged in columns and rows in the spreadsheet.

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